## CLEAN VERSION OF AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph beginning at page 2, line 17 as follows:

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Traditional lenticular lens arrays have been designed with relatively little attention to the depth at which each lens focuses light in front of the lens array. Two configurations commonly exist, each created based on a conjecture as to how light should exit the lens array. For various reasons, existing lens array systems produce suboptimal three-dimensional images.

Please amend the paragraph beginning at page 18, line 5 as follows:

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Only a static, monochromatic, matte object point, located precisely at the virtual source point in free space, will produce a constant color and intensity across the viewing range of the image. Accordingly, light directed at various angles through point Z' from a plurality of microlenses may be graphically differentiated to the extent allowed by the angular resolution. In addition to facilitating encoding of distinct stereoimages, this angular resolution may be used, for example, to represent animation, or changes in surface qualities such as color, tone, transparency, or specularity. In other words, as the user moves and the right and left eyes intercept rays from different portions of the graphic image at backplane 116, the user perceives different (but stereoscopically matched) images that collectively represent the animation or other effect. The angular variation can also represent parallactic object geometries that will often depart from the projective locus identified by the neighboring lenses. In three-dimensional imaging, the virtual light source often appears to emanate from a location different from that suggested by the parallactic geometry of the represented object. This circumstance is indicated in FIG. 5, in that converged real image is shown as linear in section, while the simulated object is shown as convex.

Please amend the paragraph beginning at page 19, line 20 as follows:

FIG. 7 depicts the effect of chromatic aberration on magnification. Many simple lens systems of the type commonly used in arrays exhibit axial chromatic aberration. In some embodiments of the invention, this can produce an effective variation of magnification due to differences in the frequency of the converged light. Thus, blue conjugate field 220, green conjugate field 230, and red conjugate field 240 dictate effective magnifications of 13X, 15X, and 17X for blue, green and red light, respectively. Image-processing calculations may therefore be made based upon a knowledge of these differing magnifications, and the intermodulation of spatial and angular resolutions may also be varied according the wavelength(s) of light being reproduced.

a5

Please amend the paragraph beginning at page 20, line 7 as follows:

FIG. 8A shows a single hexagonal lens aperture and its associated microimage. The microimage need not have the same shape as the lens aperture. As indicated in FIG. 2, the lens elements define a common focal plane 120 and focal length F. Graphic image plane 116 is located at a distance greater than F. As shown in the figure, a microimage 125 (see FIG. 2) need not be continuous-tone, but may instead be comprised of a contiguous set of quantized image elements in the form of pixels, one of which is representatively indicated at 225. The number of pixels accessible to a given lens element 110 depends on the lens design. In the figure, lens element 110 is convex with a hexagonal emission aperture (see FIG. 1). Light from pixels accessible to lens element 110 is collected and directed toward a finite conjugate in free space. As shown in FIG. 8B, the conjugate fields of lenses 110 within the same vicinity may overlap at a location ahead of the array; that is, the magnified image 125' of microimage 125 produced by lens $110_1$ can overlap with the magnified image produced by neighboring lens $110_2$. Pixel 225' is increased in apparent size as a direct function of the magnification factor M.

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Please amend the paragraph beginning at page 22, line 5 as follows:

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FIG. 15 shows a lens 300 associated with a layered system of graphic material 360 that includes an outer dioramic microimage 365, a transparent region 370, and an inner dioramic

microimage 375. Microimage 365 is carried on a transparent substrate 380, and microimage 375 is carried on an adjacent transparent substrate 385. Because of this layered structure, the system can produce virtual light sources at distinctly separate locations as shown in FIG. 16. Graphic material at point J on microimage 365 appears to emanate from point J' behind the array, while graphic material at point K on microimage 375 optically emulates a location K' ahead of the lens 300. Thus, layered graphic material can simulate diverse virtual source locations.

a7 cont

Please amend the paragraph beginning at page 25, line 17 as follows:

FIGS. 20 and 21 illustrate the manner in which an array 500 of lenses 450 (see FIG. 18) interacts with the visual system of an observer O. This configuration does not fully correct for field curvature, but instead projects a finite conjugate field to a series of curved quadratic surfaces 510 in free space. The quadratic surface indicated at 515 represents the conjugate field of a given lens 450 within the array 500. The overlapping quadratic field 520 represents a contributing finite conjugate field produced by a neighboring lens 450. In this case, the eyes will tend to accommodate to a virtual emission that diminishes in axial distance from the lens array 500 as the viewer's position departs from alignment with the optical axis of the observed microlens. This accommodation is suggested in FIG. 21 by the two positions of the right (R) and left (L) eyes of the observer O shown at two positions in the viewing field.

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Please amend the paragraph beginning at page 26, line 21 as follows:

As in the case of axial chromatic aberration, lenses having residual field curvatures produce varied magnifications in the image-processing phase. A lens having a residual field curvature effectively varies locally in magnification, providing an angular resolution increasing toward the center of the viewing field and a spatial resolution increasing at peripheral angular locations. While this arrangement causes the resolution of the viewed image to be somewhat indeterminate according to conventional quantification methods, the combined effects of the aerial mosaic conjugate field and varied magnification assist in the visual decorrelation of the images from the regular structure of the lens array 500. The failure to decorrelate the image from

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the display structure in many prior stereoscopic displays has often yielded a quantized, pixelated appearance that has detracted from the illusion of depth.

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Please amend the paragraph continuing on page 28, as follows:

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This is shown schematically in FIGS. 22A-22C. An array of lenses corrected according to the design of FIG. 18 can usefully resolve several pixels within an aperture of 0.5mm. FIG. 22A shows a first observed mosaic finite conjugate field 600 (produced by lenses 450 with hexagonal apertures) having a lateral resolution approximately twice the lens pitch. FIG. 22B illustrates a slightly displaced conjugate field 610 reproducing the same visual material but having a local resolution approximately three times the microlens pitch. This is representative of conditions encountered using devices formed according to the invention, in which the perceived image structure differs for the right and left eyes. FIG. 22C schematically represents the conjoint graphic effect 620 represented to the observer's retinas. This viewing condition differs greatly from, for example, that created by a conventional two-dimensional LCD panel. For a two-dimensional LCD display, the two eyes fix on a common image structure, and the black background grid surrounding the pixels is often discernible. In FIGS. 22A through 22C, a small area of an autostereoscopic image according to the invention is shown including seven lenses; each of the seven lenses includes a plurality of pixels. When the eyes converge on a stereoscopic image, the eyes angle inward to adjust to the object's parallax. The conjoint effect 620 is represented in FIG. 22C, where the best image is obtained not by visually aligning the pattern of the lens outline, which is in practice difficult to visually resolve, but instead by responding to the graphic and optical characteristics of the projected pixels.

Please amend the paragraph beginning at page 32, line 4 as follows:

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The benefits of the invention may be obtained using lens designs other than those shown in FIGS. 18 and 19. For example, FIG. 23A shows gradient-index (GRIN) imaging lens 700 having a radial index gradient across the diameter $\alpha$. FIG. 24B shows a point P imaged by such a lens to a conjugate finite point P'' in a nonunitary magnification. FIG. 24A shows an elongate GRIN lens 710 yielding a noninverted image. Similar noninverting rod lenses are commonly

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used in reimaging scanners, but may also be used to rectify pseudoscopy in autostereoscopic integral imaging systems.

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